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Mercury tectonics and mapping the Neruda Quadrangle

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Man, Ben (2021). Mercury tectonics and mapping the Neruda Quadrangle. Postgraduate Research Poster Competition, The Open University.

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Version: Poster

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MERCURY TECTONICS AND MAPPING THE NERUDA QUADRANGLE

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WHY MAP MERCURY?

The BepiColombo mission is en-route to Mercury. Prior to the arrival of the spacecraft, it is imperative that a full set of comprehensive geological maps is produced, to provide context for the planned science phase of the mission.

TECTONICS?

“Study of the deformation of the rocks that make up Mercury’s crust and the forces that produce such deformation” — modified from Britannica

Tectonic landforms are abundant across Mercury’s surface revealing a complex history of crustal evolution. *When and why did they form? Did they all form at the same time? Are they still active today?*

Figure 1 (Central Globe) — “Enhanced Color Mosaic” ~665 metres per pixel resolution. Perspective view of the globe of Mercury. Colours are exaggerated to enhance the physical, chemical and mineralogical differences between Mercury’s surface rocks.

Linework: **White** bounding box = Neruda Quadrangle with a 5° overlap. **Black square** = Figure 2, **Red & pink** lines = tectonic lineaments, **black** lines = crater rims, **yellow** = crater floor materials.

ZOOM in for a closer look!

PROJECT OVERVIEW

I am producing a geological map of the Neruda Quadrangle of Mercury at a scale of 1:3M. I am also investigating Mercury’s tectonic landforms where I am trying to find out their age and understand their formation mechanisms in order to constrain Mercury’s tectonic evolution.

I am digitally mapping using ArcGIS software with data collected between 2011–2015 by NASA’s MESSENGER (Mercury Surface, Space ENvironment, GEochemistry and Ranging) Mercury Dual Imaging System.

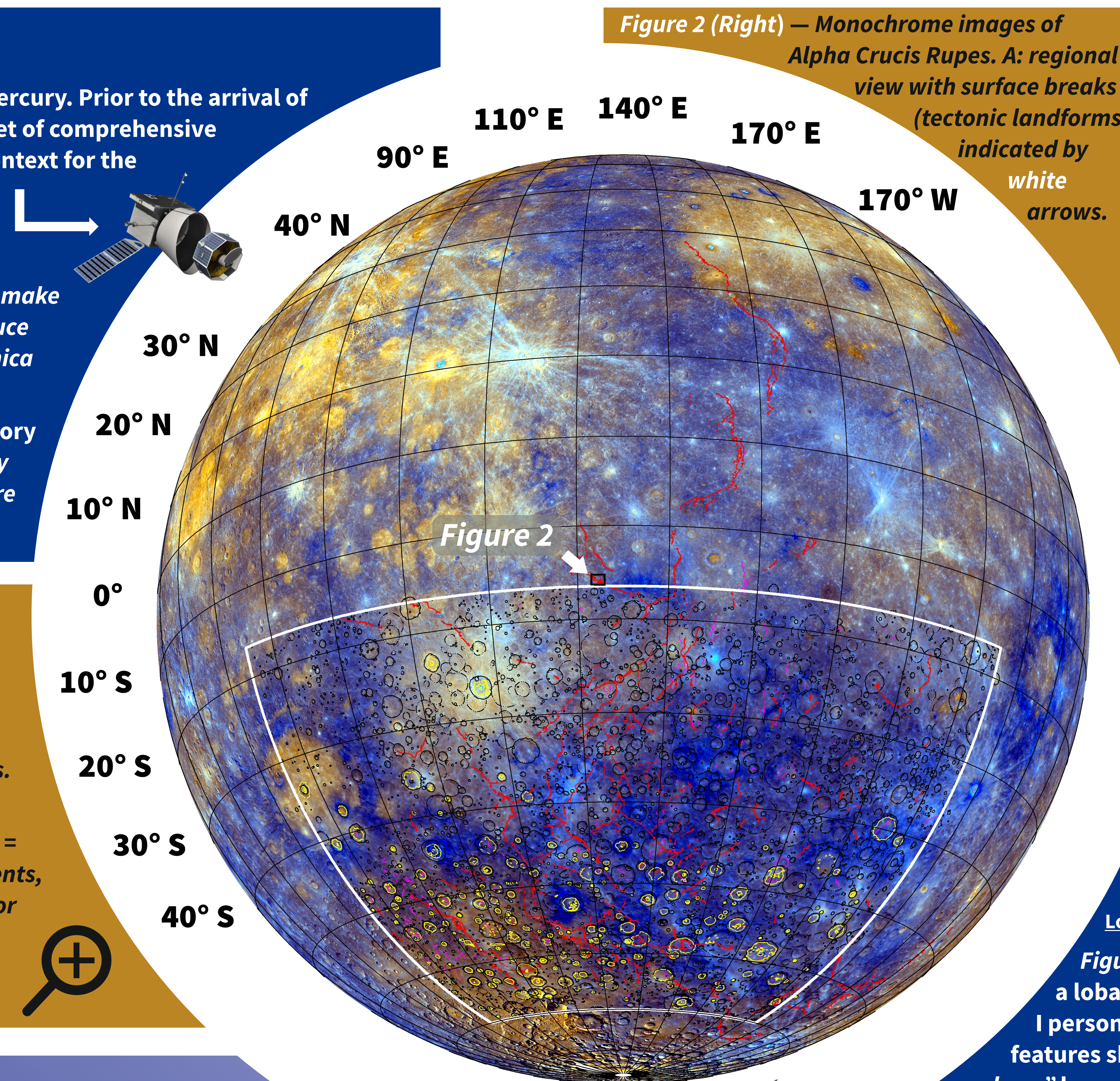
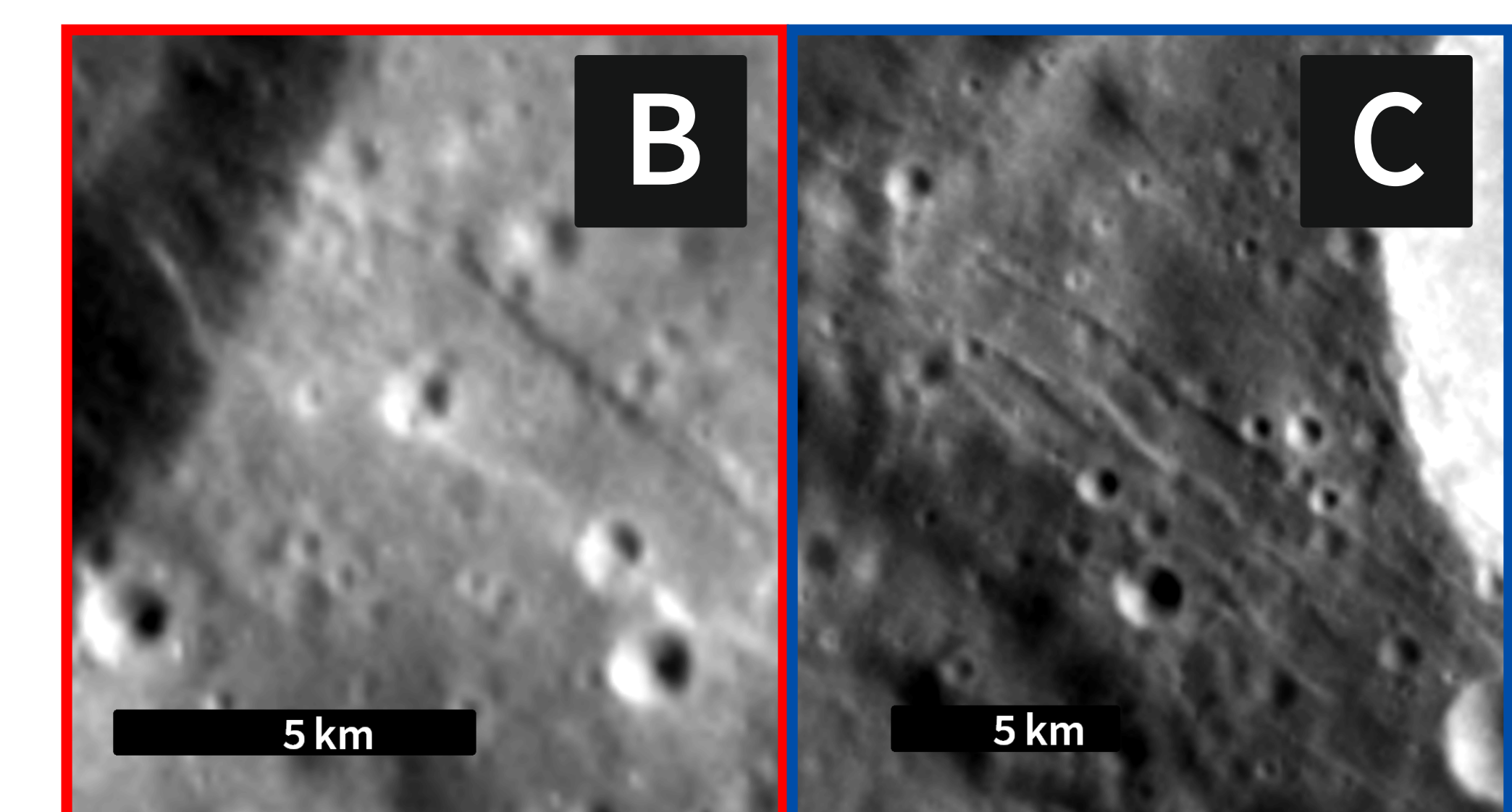
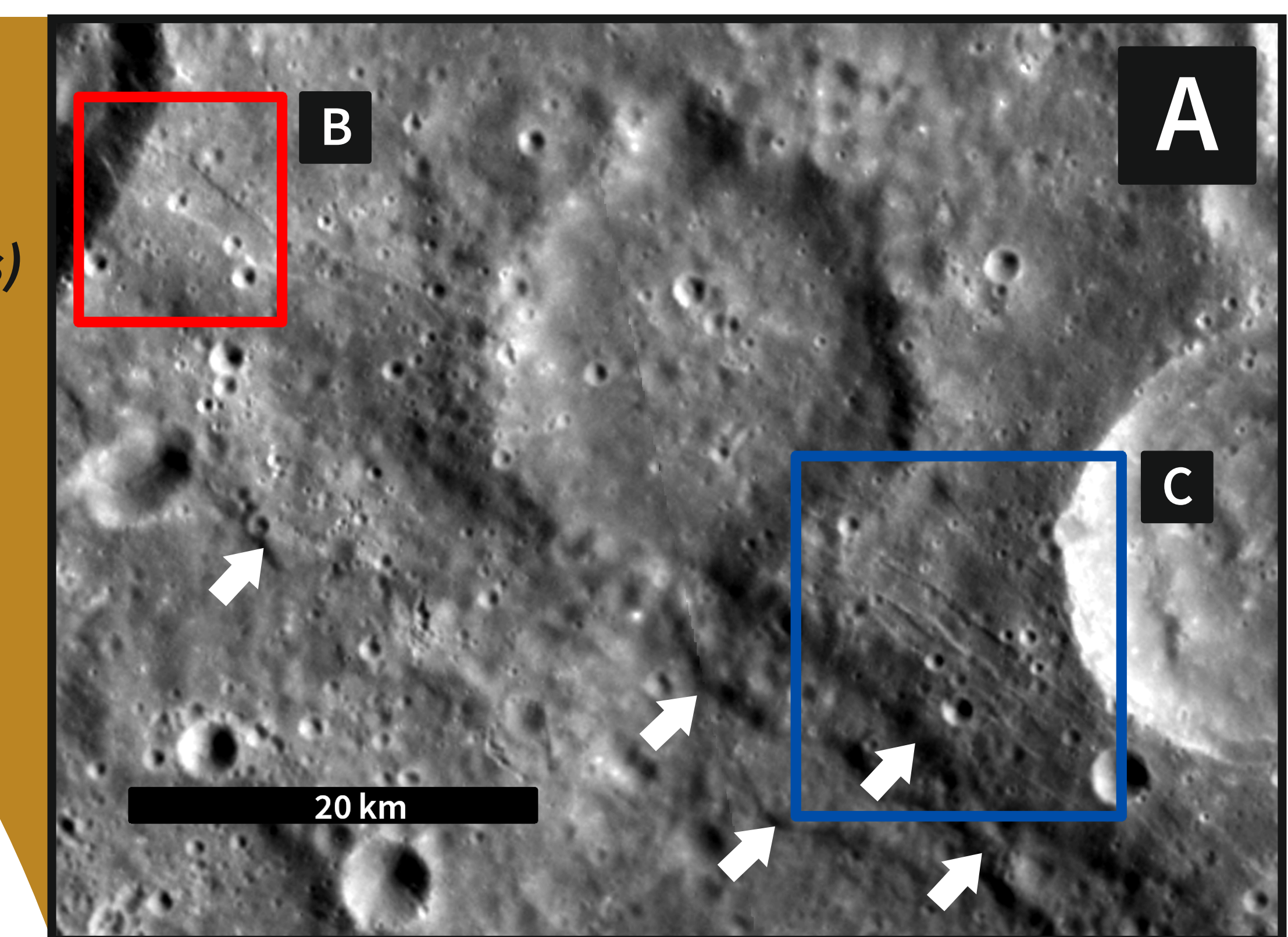


Figure 2 (Right) — Monochrome images of Alpha Crucis Rupes. A: regional view with surface breaks (tectonic landforms) indicated by white arrows.

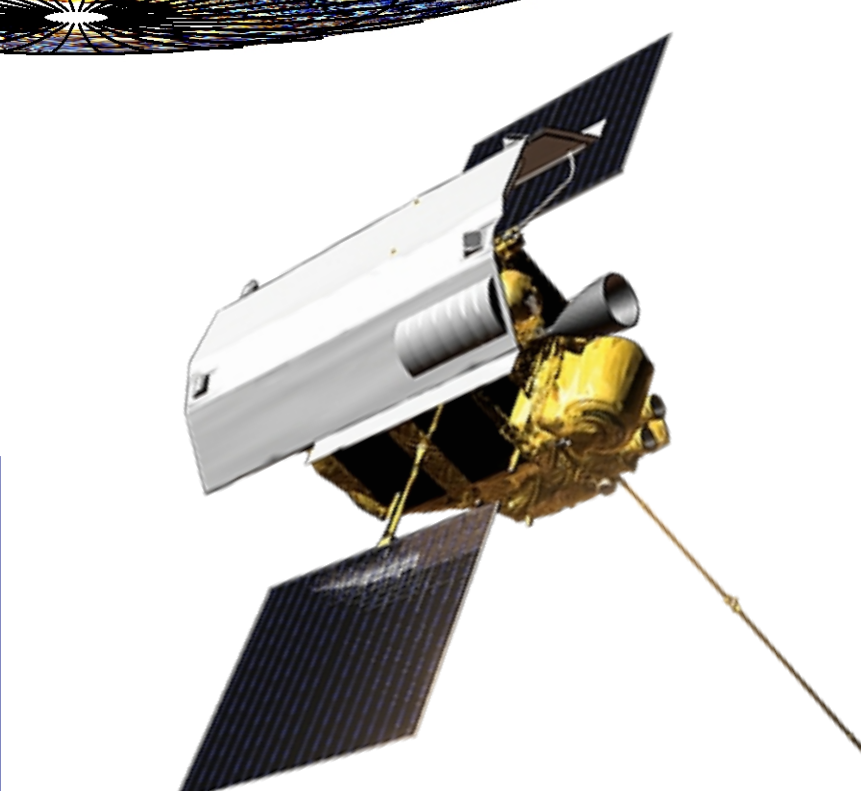


TECTONIC STUDIES

Thrust fault: break in the crust where older rocks are pushed over younger rocks. Formed by compression.

Lobate scarp: surface manifestation of a thrust fault on Mercury.

Figure 2 A shows the front scarp of Alpha Crucis Rupes, a lobate scarp. Alpha Crucis is particularly interesting as I personally discovered the rare small-scale extensional features shown enlarged in Figure 2 B & C. These “crestal grabens” have formed due to flexing of the crust induced by movement of the lobate scarp, causing small blocks of rock to slip downwards. Importantly, these small structures are not expected to remain visible over 100s of millions of years as they are easily destroyed by impact processes. They are therefore likely to be geologically young and may be a crucial piece of evidence to support the theory that Mercury is tectonically active today. I hope to discover more of these features to show that they are more common than previously acknowledged and thus support the theory that global contraction of Mercury is ongoing.



Poster Image Credit:
BepiColombo, MESSENGER &
Mercury Images — NASA/
JHAPL/CIW